I. **PATENT ABSTRACTS OF JAPAN**

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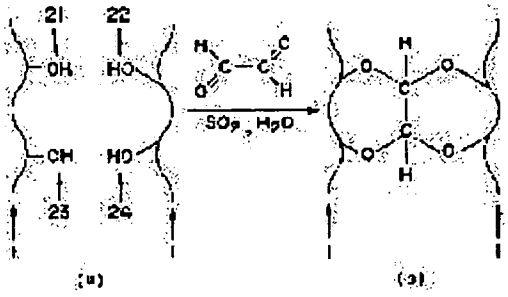
(54) **DIMENSIONALLY STABILIZED WOOD AND MANUFACTURE THEREOF**

(57)Abstract:
PURPOSE: To obtain wood, the waterproof and moistureproof effects of which are favorable and which is excellent in dimensional stability and acoustic by a method wherein at least three hydroxyl groups of cellulose chains, which are included in wood cells and adjacent to each other, are crosslinked by one molecule of a crosslinker.
CONSTITUTION: After being humidity-conditioned, wood is put in an enclosed container for evacuation. After that, a crosslinker such as a multivalent aldehyde preferably of a water solution of a cyclic urea compound having a plurality of hydroxyl groups 21-24 is poured in the container so as to infiltrate it in the wood for a certain period of time. After that, the wood is taken out of the container, air-dried and put in another enclosed reaction tank so as to introduce sulfur dioxide as a catalyst in the tank after being evacuated in order to thermally react the wood with the sulfur dioxide. Thus, the wood, the moisture absorption of which is suppressed and the dimensional stability of which is improved, is obtained.



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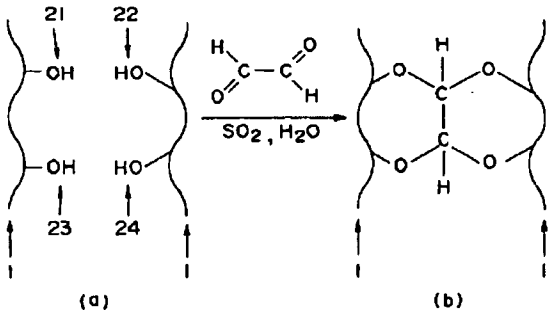
(54)【発明の名称】　寸法安定化木材とその製法

(57)【要約】

【目的】　寸法安定性および音響特性に優れた木材を得る。

【構成】　寸法安定化木材を得るため、木材を化学処理する際に、架橋剤として多価アルデヒドまたは複数の水酸基を有する環状尿素化合物、触媒として二酸化硫黄を使用し、木材に含まれ隣接するセルロース鎖１、１の少なくとも３つ以上の水酸基２１～２４が、前記架橋剤１分子と架橋結合した架橋構造を形成させることを特徴とする。



【特許請求の範囲】
【請求項１】　木材の細胞に含まれ隣接するセルロース鎖の少なくとも３つ以上の水酸基が、架橋剤１分子と架橋結合した架橋構造をなしたことを特徴とする寸法安定化木材。
【請求項２】　木材に多価アルデヒドを含浸し、ついで二酸化硫黄に接触させることを特徴とする寸法安定化木材の製法。
【請求項３】　木材に複数の水酸基を有する環状尿素化合物を含浸し、ついで二酸化硫黄に接触させることを特徴とする寸法安定化木材の製法。
【発明の詳細な説明】
【０００１】
【産業上の利用分野】本発明は寸法安定性および音響特性にすぐれた寸法安定化木材とその製法に関する。
【０００２】
【従来の技術】従来から木材は全ての国において重要な天然資源の一つであり、物理的および機械的性質が優れており加工性が良いことから、建築用、音響製品用などきわめて広い用途で使用されている。木材には多量のセルロースが含まれており、セルロースは多量の水酸基を有していることから、ミセルと呼ばれる親水コロイド状の構造を成している。このため、木材は吸湿、脱湿によって膨張または収縮し、寸法の狂いや割れを生じさせ、さらには強度や電気的性質にも不安定さを残すものであった。特に前記木材を木質音響部材として楽器類やスピーカーの響板として使用する際、大気中の湿度によって、音響特性や寸法が変化するという点が問題として指摘されている。
【０００３】そこで木材の吸湿性を低下させ、寸法安定性を高めるための方法としてホルマール化処理などの化学処理が知られている。このホルマール化処理は、セルロース鎖の水酸基の間に架橋を作り、水分の侵入を防ぐことによって防湿性を得るものである。このホルマール化処理とは、密閉容器中に木材と架橋剤となるトリオキサン、テトラオキサン、ホルムアルデヒドなどのアルデヒド源とを仕込み、この密閉容器に二酸化硫黄などのホルマール化触媒を導入し、所定時間加熱して行うものである。この方法では、わずか数%以下の重量増加で高い寸法安定性が得られることに特徴がある。
【０００４】ところが、ホルマール化処理において、架橋剤として前記アルデヒド源を使用した場合、図５に示すように、隣接したセルロース鎖１、１の水酸基２１～２４のうち２つが、アルデヒド残基を中心に１つの鎖状の架橋構造をなす、１次元の架橋構造を形成する。このため架橋の度合が低く、常に高度な寸法安定性を維持することは困難であった。さらにホルムアルデヒド自身が常温で容易に重合するため、セルロース鎖１、１の水酸基２１～２４との反応に関与する量が減少し、セルロース鎖１、１の架橋効率が低下するという問題があった。一方、ホルマール化処理過程におけるホルムアルデヒドの漏洩、処理済みの木材からの漏洩の可能性もあり、人体への悪影響の心配も無視できない。さらに処理過程で排出される汚水に含まれるホルムアルデヒドを無害化するための処理が必要で工程上のコスト高などの問題もあった。
【０００５】
【発明が解決しようとする課題】本発明はこれらの事情に鑑みてなされたものであって、防水、防湿効果が良好で、寸法安定性、音響特性に優れた木材を提供することを目的としている。
【０００６】
【課題を解決するための手段】かかる目的は、木材の細胞に含まれ隣接するセルロース鎖の少なくとも３つ以上の水酸基が、架橋剤１分子と架橋結合した架橋構造をなすように、安定化処理を施すことで解決される。そして、この架橋構造は、多価アルデヒドまたは複数の水酸基を持った環状尿素化合物を架橋剤とすることで形成できる。
【０００７】
【作用】架橋剤として多価アルデヒド、または複数の水酸基を持った環状尿素化合物を使用することで脱水、縮合が起こり、木材の細胞に含まれ、隣接するセルロース鎖の少なくとも３つ以上の水酸基が、前記架橋剤１分子と架橋結合した架橋構造をなす。
【０００８】次に本発明の安定化処理法について具体的に説明する。本発明では、安定化処理を施す前の木材である未処理材の形状は、架橋剤や触媒が浸透しやすいように、表面積が広く厚みの薄い板状のものが望ましい。大きさは安定化処理において使用する密閉容器、密閉反応槽の容量に応じて、適宜選択できる。また、未処理材の種類は何ら限定されるものではないが、ルーマニアスプルース、シトカスプルース、エゾ松、カエデなどが好ましい。
【０００９】まず、適当な大きさの未処理材を調湿する。これは未処理材の含水率が安定化処理後の寸法安定性、音響特性にばらつきを生じさせる一因になっているためである。このため、本発明においては、その含水率を５～２０%の範囲とすることが好ましい。
【００１０】ついで、調湿された未処理材を密閉容器に入れ、減圧、排気する。ここで減圧するのは、以後の架橋剤水溶液の注入、未処理材への浸透速度を早める効果を狙うためである。そして、架橋剤である多価アルデヒドまたは複数の水酸基を持つ環状尿素化合物を溶解させた架橋剤水溶液を密閉容器に注入し、未処理材を架橋剤水溶液に一定時間浸す。
【００１１】ここで使用される架橋剤の具体例としては、グリオキザール、グルタルアルデヒド、スクシンジアルデヒドなどの多価アルデヒド、あるいはジメチロールジヒドロキシエチレン尿素、ジメチロールエチレン尿

素、ジメチルジヒドロキシエチレン尿素などの複数の水酸基を持った環状尿素化合物が挙げられる。また、架橋剤水溶液の濃度は１～５０重量%が好ましい。これは１%未満では安定化処理が不十分であり、また５０%を越えてもその過剰分は安定化処理に寄与しないからである。含浸時間は、１～７２時間、また含浸温度は１０～５０℃の範囲が好ましく、未処理材の形状、大きさ、種類などによって前記の範囲内で任意に設定できる。

【００１２】その後前記未処理材を取り出し一定期間風乾する。そして、前記密閉容器とは別の密閉反応槽に入れ、減圧、排気した後、触媒である二酸化硫黄を導入し、加熱反応させる。反応後未反応ガスを減圧し排気したのち、密閉反応槽より安定化処理が施された寸法安定化木材を取り出す。ここで安定化処理の触媒として使用する二酸化硫黄の導入量は、密閉反応槽容量の１～４０%が好ましい。これは、二酸化硫黄が均一な安定化処理に寄与するには未処理材の組織内部に充分浸透する必要があり、このために一定以上のガス圧が必要なことによる。１%未満では未処理材内部に均一に浸透することが期待できず、４０%を越えても過剰となって無駄になるからである。さらに、密閉反応槽内での加熱温度は８０～１４０℃、加熱時間は１～７２時間が好ましく、未処理材の種類、形状や密閉反応槽の容量、触媒の濃度などによって適宜選択できる。

【００１３】以上のようにして得られた寸法安定化木材においては図１（ｂ）、図２（ｂ）に示すように、セルロース鎖１、１の水酸基２１～２４の３つ以上が、架橋剤１分子と架橋結合し、架橋構造をなしている。（以下この架橋構造を２次元の架橋構造とする。）例えば図１（ａ）（ｂ）は、多価アルデヒドであるグリオキザールを架橋剤として使用した場合のものを示してある。グリオキザールは、一番単純なジアルデヒドであり、セルロース鎖１、１の水酸基２１～２４と反応して縮合され、図１（ｂ）に示すように、アルデヒド残基を骨格として、４つの酸素原子を配した、２次元の架橋構造をなす。

【００１４】同様に、図２には複数の水酸基を有する環状尿素化合物であるジメチロールジヒドロキシエチレン尿素を架橋剤として使用した場合を示している。これもセルロース鎖１、１の水酸基２１～２４が環状尿素化合物を中心に、図２（ｂ）に示すような、２次元の架橋構造をなしている。

【００１５】以上のように、本発明の安定化処理により、従来のホルマール化処理に比べて架橋の度合が高い寸法安定化木材がえられることが期待できる。このことは、寸法安定性や音響的性能の改善につながる。よって、寸法安定性は容積膨張率を、音響的性能は損失正接を指標として評価できる。容積膨張率は以下（Ａ）式で求められるものであって%で表される。Ｖ′は風乾または飽水状態での木材の体積、Ｖは絶乾での木材の体積を示すものである。

$$\text{容積膨張率}(\%) = \frac{V' - V}{V} \qquad (A)$$

この値が低い程、寸法安定性が高いということになる。また、損失正接はｔａｎδで表され、この値が低いほどエネルギー損失が少なく、好ましい音質が提供できるとされている。本発明の寸法安定化木材では、容積膨張率（%）は、架橋剤に多価アルデヒドを用いた場合、風乾状態で２～４%、飽水状態で３～５%、また、架橋剤に複数の水酸基を有する環状尿素化合物を用いた場合は風乾状態で２～４%、飽水状態で３～９%となる。さらに、損失正接は多価アルデヒドを用いた場合は３．９～５．９×10^{-3}、複数の水酸基を有する環状尿素化合物を用いた場合は４．７～６．７×10^{-3}となる。

【００１６】以下、具体例を示し、本発明の効果を明らかにする。

（実施例１）まず、未処理材として、含水率９～１０%に調整された重量４０ｇ、体積９０ｃｃのシトカスプルースを５本用意し、容積３リットルの密閉容器中に入れ、３トールに減圧した。ここで架橋剤として１０重量%のグリオキザール水溶液を約２５００ｃｃ注入し、完全にシトカスプルースを含浸させた。ついで常温で２４時間放置し、取り出して１週間風乾した。

【００１７】次に、風乾したものを９リットルの密閉反応槽に入れ、１００トールに減圧し、触媒である二酸化硫黄を９００ｍｌ導入した。これをオーブンに入れ、１２０℃で２４時間加熱を行った。反応後３トールに減圧、排気し、未反応ガスを除去した。前記の方法で処理された寸法安定化木材を風乾、絶乾、飽水状態でのそれぞれの体積を測定し、容積膨張率を求めた。なお風乾は、気温２５℃、湿度６５%のもと、２週間行った。こうして得られた寸法安定化木材の容積膨張率を求めたところ、風乾状態で、最大３．１%、最小２．８%、平均２．９%、飽水状態で、最大４．４%、最小３．７%、平均３．９%であった。ついで、前記寸法安定化木材の音響的性能を調べるため、損失正接を０ないし３５００Ｈｚの範囲で測定したところ、最大５６７×10^{-5}（５５５Ｈｚ）、最小４１２×10^{-5}（６３９Ｈｚ）を示し、平均は４６３×10^{-5}であった。

【００１８】（実施例２）ここでは架橋剤としてジメチロールジヒドロキシエチレン尿素を用いた他は、前記実施例１と同様の方法で行い、寸法安定化木材を得た。こうして得られた寸法安定化木材の容積膨張率を測定したところ、風乾状態で最大２．４%、最小２．２%、平均２．３%、飽水状態で、最大６．４%、最小５．８%、

平均６．１％であった。また損失正接を測定したところ、最大６７０×１０$^{-5}$（５４３Ｈｚ）、最小５１８×１０$^{-5}$（６７０Ｈｚ）を示し、平均は、５８１×１０$^{-5}$であった。

【００１９】（比較例）前記未処理材に対し、同様の方法で容積膨張率を求め、損失正接を測定した。この容積膨張率は風乾状態で、最大４．６％、最小３．５％、平均４．０％、飽水状態で、最大１３．０％、最小７．１％、平均１０．４％であり、、損失正接は、最大７３１×１０$^{-5}$（５４３Ｈｚ）、最小５６１×１０$^{-5}$（６７４Ｈｚ）、平均６５３×１０$^{-5}$であった。

【００２０】ここで、前記実施例１、実施例２の結果を、比較例と比べながら説明する。まず、実施例１で得られる寸法安定化木材は、比較例に対し容積膨張率が風乾状態で２７％、飽水状態で６２％低下したことになる。また、実施例２で得られる寸法安定化木材は風乾状態で４２％、飽水状態で４２％低下したことになる。また、損失正接の結果については、実施例１では比較例に対し、２９％、実施例２では、１１．０％低下したことになる。

【００２１】

【発明の効果】以上説明したように、本発明の寸法安定化木材は、多価アルデヒドまたは複数の水酸基を持つ環状尿素化合物で安定化処理をすることによって、隣接するセルロース鎖の少なくとも３つ以上の水酸基が、架橋剤１分子と架橋結合した架橋構造を形成したものであるので、吸湿性が抑制され、寸法安定性が向上する。また、損失正接が低下し、音響特性が改善される。このため、各種の楽器やスピーカーなどの響板に使用した際、良好な音質を長期に渡って維持できる。さらに、本発明で使用される架橋剤はホルムアルデヒドより重合しにくく、架橋反応に有効に消費されて、無駄がなく、また、不揮発性であることから、安定化処理中、処理後に、人体に悪影響を及ぼさないなどの効果も得られる。

【図面の簡単な説明】

【図１】本発明の多価アルデヒドを架橋剤として使用した場合の一実施例における安定化処理の反応を示す模式図である。

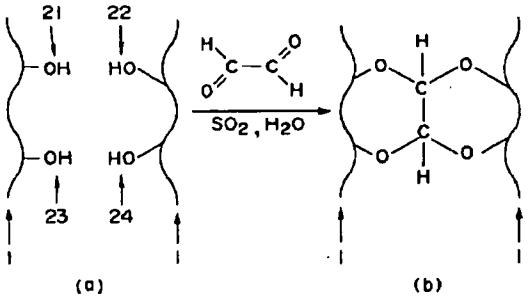
【図２】本発明の複数の水酸基を持つ環状尿素化合物を架橋剤として使用した場合の一実施例における安定化処理の反応を示す模式図である。

【図３】本発明の多価アルデヒドを架橋剤として使用した場合の一実施例における周波数と損失正接との関係を示すグラフである。

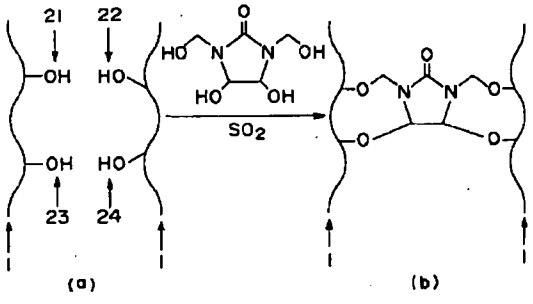
【図４】本発明の複数の水酸基を持つ環状尿素化合物を架橋剤として使用した場合の一実施例における周波数と損失正接との関係を示すグラフである。

【図５】アルデヒド源を架橋剤として使用した場合の一実施例におけるホルマール化反応を示す模式図である。

【図１】



【図２】



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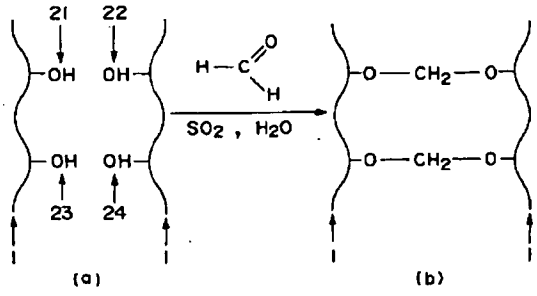
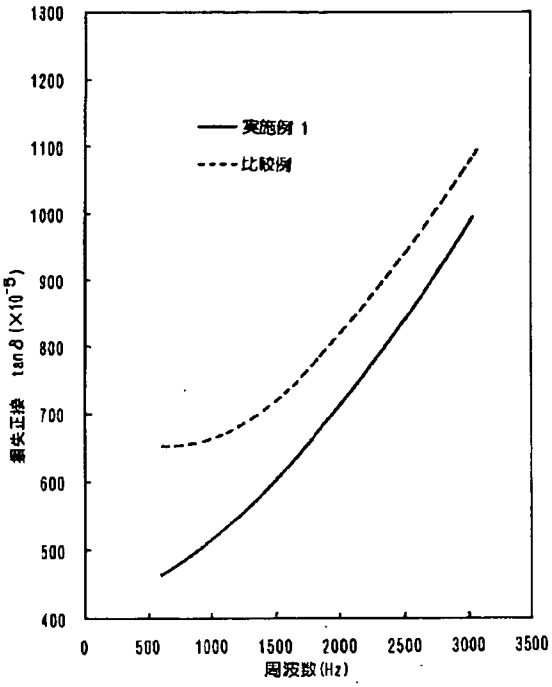
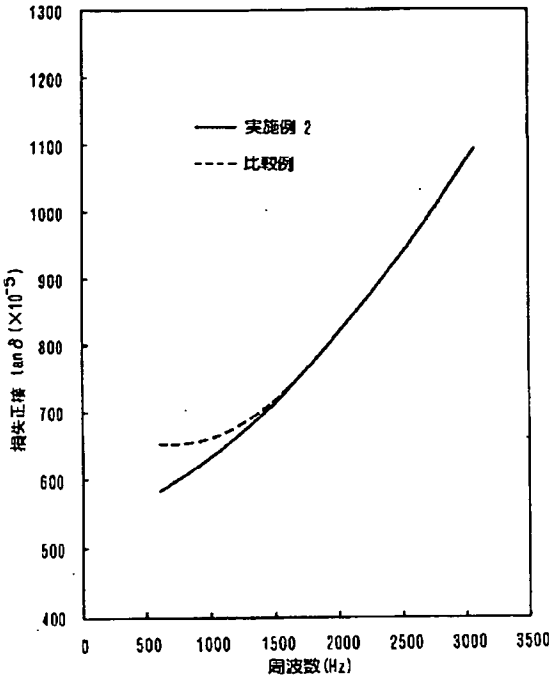


【図３】


1300
1200
1100
1000
900
800
700
600
500
400
0
500
1000
1500
2000
2500
3000
3500
実施例１
比較例
損失正接 tanδ (×10⁻⁵)
周波数(Hz)

【図４】


1300
1200
1100
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900
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700
600
500
400
0
500
1000
1500
2000
2500
3000
3500
実施例２
比較例
損失正接 tanδ (×10⁻⁵)
周波数(Hz)

FULL CONTENTS

[Claim(s)]

[Claim 1] Dimensional stabilization wood with which at least three or more hydroxyl groups of the cellulose chain which is contained in the cell of wood and adjoins are characterized by making the bridge construction structure which carried out bridge construction combination with crosslinking agent 1 molecule.

[Claim 2] The process of the dimensional stabilization wood characterized by sinking into wood and subsequently to sulfur dioxide contacting ** value aldehyde in it.

[Claim 3] The process of the dimensional stabilization wood characterized by sinking into wood and subsequently to sulfur dioxide contacting the annular urea compound which has two or more hydroxyl groups in it.

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the dimensional stabilization wood excellent in dimensional stability and an acoustic feature, and its process.

[0002]

[Description of the Prior Art] In all countries, it is one of the important natural resources, the former to wood is excellent in a physical variance and mechanical properties, and since processability is good, it is used for very large uses, such as an object for construction, and an object for audio goods. A lot of cellulose is contained in wood, and since cellulose has a lot of hydroxyl groups, it has constituted the structure of the shape of a hydrophile colloid called micell. For this reason, wood was what expands or contracts, is made to produce the deviation of a size, and a crack, and also leaves instability further to intensity and electric character by moisture absorption and dehumidification. When using it as a soundboard of musical

instruments and a speaker by using said especially wood as a woody sound member, the point that an acoustic feature and a size change is pointed out as a problem with the humidity in the atmosphere.

[0003] Then, the hygroscopicity of wood is reduced and chemical treatments, such as HORUMARU-ized processing, are known as a method for raising dimensional stability. This HORUMARU-ized processing makes bridge construction between the hydroxyl groups of a cellulose chain, and acquires dampproofing by preventing invasion of moisture. Aldehyde sources used as wood and a crosslinking agent, such as bird oxane, tetra-oxane, and formaldehyde, are taught into an airtight container, HORUMARU-ized catalysts, such as sulfur dioxide, are introduced into this airtight container, predetermined time heating is carried out, and this HORUMARU-ized processing is performed. By this method, there is the feature in high dimensional stability being acquired by the increase in weight of several [only] percent or less.

[0004] However, in HORUMARU-ized processing, when said aldehyde source is used as a crosslinking agent, as shown in drawing 5 , two of the hydroxyl groups 21-24 of the adjoining cellulose chains 1 and 1 form the 1-dimensional bridge construction structure of making the bridge construction structure of the shape of one chain focusing on an aldehyde residue. For this reason, the degree of bridge construction was low and it was difficult to maintain always advanced dimensional stability. Furthermore, since the formaldehyde itself polymerized easily in normal temperature, the quantity which participates in a reaction with the hydroxyl groups 21-24 of the cellulose chains 1 and 1 decreased, and there was a problem that the bridge construction efficiency of the cellulose chains 1 and 1 fell. On the other hand, there is possibility of disclosure of the formaldehyde in HORUMARU-ized processing process and the disclosure from processed wood, and worries about the bad influence to a human body cannot be disregarded, either. Furthermore, it needed to be processed for detoxicating the formaldehyde contained in the sewage discharged in processing process, and problems, such as a cost overrun on a process, also had it.

[0005]

[Problem to be solved by the invention] This invention is made in view of these situations, and waterproofing and the prevention-of-moisture effect are good, and aim at offering the wood excellent in dimensional stability and an acoustic feature.

[0006]

[Means for solving problem] This purpose is solved by performing stabilizing treatment so that the bridge construction structure in which at least three or more hydroxyl groups of the cellulose chain which is contained in the cell of wood and adjoins carried out bridge construction combination with crosslinking agent 1 molecule may be made. And this bridge construction structure can form an annular urea compound with ** value aldehyde or two or

more hydroxyl groups by considering it as a crosslinking agent.
[0007]
[Function] Drying and condensation take place by using ** value aldehyde or an annular urea compound with two or more hydroxyl groups as a crosslinking agent, it is contained in the cell of wood, and at least three or more hydroxyl groups of an adjoining cellulose chain make the bridge construction structure which carried out bridge construction combination with said crosslinking agent 1 molecule.
[0008] Next, the stabilizing treatment method of this invention is explained concretely. The tabular thing with large surface area of the form of the unsettled material which is the wood before performing stabilizing treatment in this invention which has thin thickness is desirable so that a crosslinking agent and a catalyst may permeate easily. A size can be suitably chosen according to the capacity of the airtight container used in stabilizing treatment, and a sealing reaction vessel. Moreover, although the kind of unsettled material is not limited at all, the Rumania spruce, the Sitka spruce, an EZO pine, maple, etc. are desirable.
[0009] first, the unsettled material of a suitable size -- ******** . This is because the moisture content of unsettled material is the cause which makes the dimensional stability after stabilizing treatment, and an acoustic feature produce variation. For this reason, in this invention, it is desirable to make that moisture content into 5 to 20% of range.
[0010] Subsequently, the ****(ed) unsettled material is put into an airtight container, and is decompressed and exhausted. It decompresses here in order to aim at the effect which brings forward pouring of future crosslinking agent solution, and the osmosis speed to unsettled material. And the crosslinking agent solution in which the annular urea compound with the ** value aldehyde or two or more hydroxyl groups which are crosslinking agents was dissolved is poured into an airtight container, and unsettled material is dipped in crosslinking agent solution fixed time.
[0011] As an example of the crosslinking agent used here, glyoxal, glutaric aldehyde, An annular urea compound with two or more hydroxyl groups, such as ** value aldehyde, such as succindialdehyde, or dimethylol dihydroxyethylene urea, dimethylol ethylene urea, and JIMECHIRU dihydroxyethylene urea, is mentioned. Moreover, as for the concentration of crosslinking agent solution, 1 to 50 weight % is desirable. It is because less than 1% of stabilizing treatment is [this] insufficient, and the amount of the excess does not contribute to stabilizing treatment even if it exceeds 50%. Sinking-in time has the desirable range of 10-50 degrees C, and can set up arbitrarily 1 to 72 hours, and sinking-in temperature within the limits of the above according to the form of unsettled material, a size, a kind, etc.
[0012] The account of back to front unsettled material is taken out, and it is air-dry during a fixed period. And it puts into a sealing reaction vessel different from said airtight container, and after decompressing and exhausting, the sulfur dioxide which is a catalyst is introduced and a

heating reaction is carried out. After decompressing and exhausting after-reaction unreacted gas, the dimensional stabilization wood with which stabilizing treatment was performed is taken out from a sealing reaction vessel. 1 to 40% of the sealing reaction vessel capacity of the amount of introduction of the sulfur dioxide used as a catalyst of stabilizing treatment here is desirable. This needs to permeate the in-house part of unsettled material enough, for sulfur dioxide's contributing to uniform stabilizing treatment, for this reason it is because the gas pressure more than fixed is required. It is because it becomes superfluous and becomes useless at less than 1%, even if it cannot expect to permeate the inside of unsettled material uniformly but exceeds 40%. Furthermore, as for the cooking temperature within a sealing reaction vessel, 1 to 72 hours is desirable, and it can choose suitably 80-140 degrees C and cooking time with the kind of unsettled material, form and the capacity of a sealing reaction vessel, the concentration of a catalyst, etc.

[0013] As the dimensional stabilization wood obtained as mentioned above is shown in drawing 1 (b) and drawing 2 (b), three or more of the hydroxyl groups 21-24 of the cellulose chains 1 and 1 carry out bridge construction combination with crosslinking agent 1 molecule, and they are making bridge construction structure. (This bridge construction structure is made into two-dimensional bridge construction structure below.) For example, drawing 1 (a) and (b) have shown the thing at the time of using glyoxal which is ** value aldehyde as a crosslinking agent. Glyoxal is the simplest JIARUDEHIDO, and as it reacts with the hydroxyl groups 21-24 of the cellulose chains 1 and 1, and is condensed and it is shown in drawing 1 (b), it makes the two-dimensional bridge construction structure where four oxygen atoms were arranged by making an aldehyde residue into a frame.

[0014] The case where similarly dimethylol dihydroxyethylene urea which is the annular urea compound which has two or more hydroxyl groups is used for drawing 2 as a crosslinking agent is shown. This is also making the bridge construction structure of two dimensions as the hydroxyl groups 21-24 of the cellulose chains 1 and 1 show to drawing 2 (b) centering on an annular urea compound.

[0015] As mentioned above, it is expectable that dimensional stabilization wood with a high degree of bridge construction is obtained by the stabilizing treatment of this invention compared with the conventional HORUMARU-ized processing. This leads to an improvement of dimensional stability and acoustical performance. Therefore, the dimensional stability can evaluate the capacity rate of expansion, and the acoustical performance can evaluate loss right ** as an index. The capacity rate of expansion is called for by the (A) formula below, and is expressed with %. V' shows the volume of the wood in air-drying or saturated state, and V shows the volume of the wood in ****.

$$\text{容積膨張率}(\%) = \frac{V' - V}{V} \qquad (A)$$

It will be said that dimensional stability is high, so that this value is low. Moreover, loss right ** is expressed with tandelta and supposed that there is so little energy loss that this value is low, and desirable sound quality can be offered. In the dimensional stabilization wood of this invention, in the state of air-drying, 2 to 4%, the capacity rate of expansion (%) becomes in the state of air-drying, when the annular urea compound which has two or more hydroxyl groups in 3 to 5% and a crosslinking agent at saturated state when ** value aldehyde is used for a crosslinking agent is used, and it becomes 3 to 9% with saturated state 2 to 4%. Furthermore, loss right ** is set to 4.7 to 6.7x10-3 when the annular urea compound which has 3.9 to 5.9x10-3 and two or more hydroxyl groups when ** value aldehyde is used is used.

[0016] Hereafter, an example is shown and the effect of this invention is clarified.

(Work example 1) Five Sitka spruce with a weight of 40g and a volume of 90 cc adjusted to 9 to 10% of moisture content was first prepared as unsettled material, and it put in into the airtight container with a capacity of 3l., and decompressed to 3 Thor. 10weight % of glyoxal solution [about 2500 cc of] was poured in as a crosslinking agent here, and the Sitka spruce was infiltrated completely. Subsequently, in normal temperature, it was neglected for 24 hours, and it took out and was air-dry for one week.

[0017] Next, the air-dry thing was put into the 9l. sealing reaction vessel, it decompressed to 100 Thor, and 900ml of sulfur dioxide which is a catalyst was introduced. This was put into oven and heating was performed at 120 degrees C for 24 hours. It decompressed and exhausted to after-reaction 3 Thor, and unreacted gas was removed. Each volume in air-drying, ****, and saturated state was measured for the dimensional stabilization wood processed by the aforementioned method, and it asked for the capacity rate of expansion. In addition, air-drying carried out for two weeks also as 25 degrees C of temperature, and that of 65% of humidity. In this way, when asked for the capacity rate of expansion of the obtained dimensional stabilization wood, they were a maximum of 4.4%, a minimum of 3.7%, and an average of 3.9% in saturated state in the state of air-drying a maximum of 3.1%, a minimum of 2.8%, and an average of 2.9%. Subsequently, in order to investigate the acoustical performance of said dimensional stabilization wood, when loss right ** was measured in 0 to 3500Hz, a maximum of 567x10-5 (555Hz) and a minimum of 412x10-5 (639Hz) were shown, and the average was 463x10-5.

[0018] (Work example 2) Dimethylol dihydroxyethylene urea was used as a crosslinking agent here, and also it carried out by the same method as said work example 1, and dimensional stabilization wood was obtained. In this way, when the capacity rate of expansion of the obtained dimensional stabilization wood was measured, they were a maximum of 6.4%, a minimum of 5.8%, and an average of 6.1% in saturated state in the state of air-drying a maximum of 2.4%, a minimum of 2.2%, and an average of 2.3%. Moreover, when loss right **

was measured, a maximum of 670x10-5 (543Hz) and a minimum of 518x10-5 (670Hz) were shown, and the average was 581x10-5.

[0019] (Comparative example) To said unsettled material, it asked for the capacity rate of expansion by the same method, and loss right ** was measured. A maximum of 4.6%, a minimum of 3.5%, and an average of 4.0%, this capacity rate of expansion is in an air-drying state, and are saturated state, are a maximum of 13.0%, a minimum of 7.1%, and an average of 10.4%, and [loss right **] It was a maximum of 731x10-5 (543Hz), a minimum of 561x10-5 (674Hz), and an average of 653x10-5.

[0020] Here, it explains, comparing the result of said work example 1 and a work example 2 with a comparative example. First, it means the capacity rate of expansion falling [the dimensional stabilization wood obtained in the work example 1] 62% with saturated state 27% in the state of air-drying to a comparative example. Moreover, it means the dimensional stabilization wood obtained in the work example 2 falling 42% with saturated state 42% in the state of air-drying. Moreover, it means falling 11.0% in the work example 2 29% to a comparative example about the result of loss right ** by a work example 1.

[0021]

[Effect of the Invention] As explained above, [the dimensional stabilization wood of this invention] Since at least three or more hydroxyl groups of the cellulose chain which adjoins by carrying out stabilizing treatment with an annular urea compound with **** aldehyde or two or more hydroxyl groups form the bridge construction structure which carried out bridge construction combination with crosslinking agent 1 molecule, hygroscopicity is controlled and dimensional stability improves. Moreover, loss right ** falls and an acoustic feature is improved. For this reason, when it is used for soundboards, such as various kinds of musical instruments and a speaker, good sound quality can be maintained over a long period of time. Furthermore, the crosslinking agent used by this invention does not polymerize as easily as formaldehyde, is consumed effective in crosslinking reaction, and does not have futility, and since it is fixity, the effect of not having a bad influence on a human body during stabilizing treatment and after processing is also acquired.

[Brief Description of the Drawings]

[Drawing 1] It is the mimetic diagram showing the reaction of the stabilizing treatment in one work example at the time of using the ** value aldehyde of this invention as a crosslinking agent.

[Drawing 2] It is the mimetic diagram showing the reaction of the stabilizing treatment in one work example at the time of using an annular urea compound with two or more hydroxyl

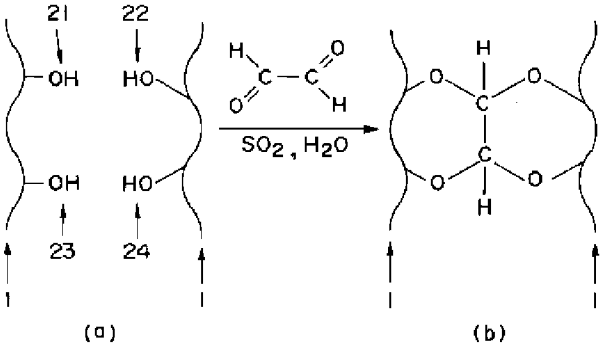
groups of this invention as a crosslinking agent.

[Drawing 3] It is the graph which shows the relation of the frequency and loss right ** in one work example at the time of using the ** value aldehyde of this invention as a crosslinking agent.

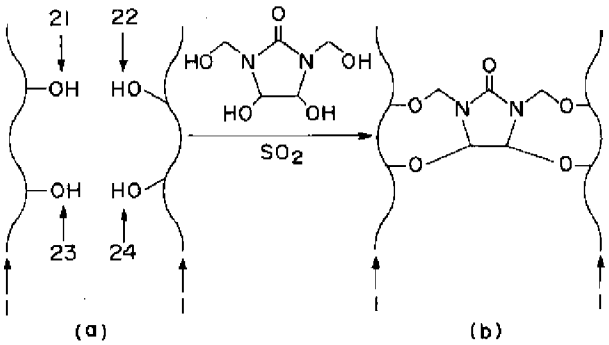
[Drawing 4] It is the graph which shows the relation of the frequency and loss right ** in one work example at the time of using an annular urea compound with two or more hydroxyl groups of this invention as a crosslinking agent.

[Drawing 5] It is the mimetic diagram showing the HORUMARU-ized reaction in one work example at the time of using an aldehyde source as a crosslinking agent.

[Drawing 1]



[Drawing 2]



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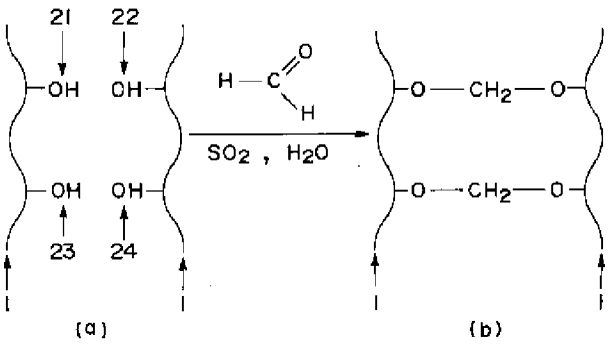
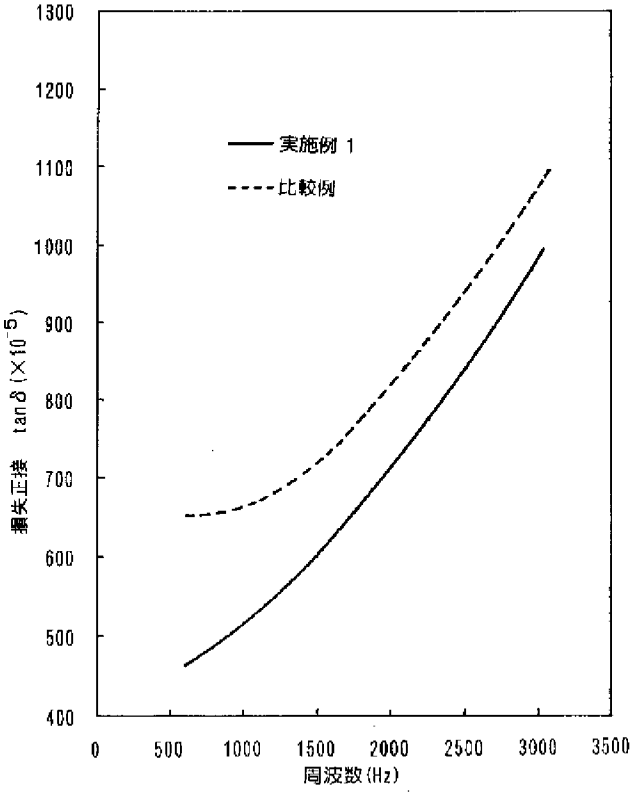


[Drawing 3]



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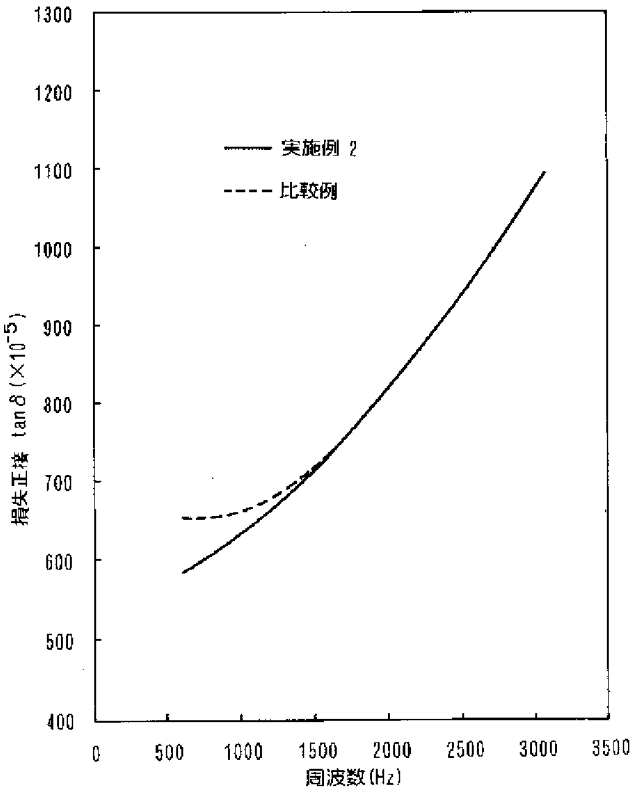

[Translation done.]